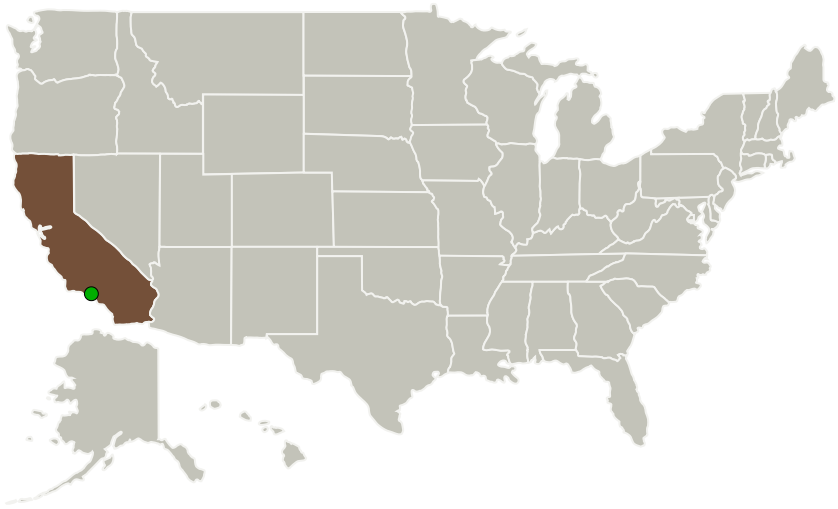
Highly Capable Micropump-Fed Propulsion System for Proximity Operations, Landing and Ascent, Phase I

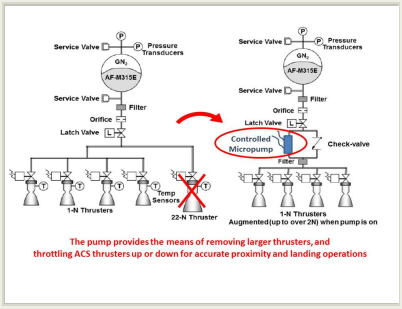
Completed Technology Project (2014 - 2014)

Project Introduction

Flight Works is proposing to expand its work in micro-gear-pumps for propulsion applications in order to provide a highly capable propulsion and attitude control system (ACS) for asteroid proximity operations, landers and return capsules. In traditional systems, larger thrusters, specific to each mission, must be employed to counter the gravity field of the target. Also, throttling these larger thrusters for proximity operations and landing is not a trivial task. With the pump, the need for these larger, more expensive thrusters is eliminated. Instead the pump allows increasing (or decreasing) and controlling the thrust of the attitude control thrusters to the levels required for operating in the target's gravity field by modulating the pump RPM/power. Typically, only a few tens of watts are needed for pump operations. Flight Works is prepared to develop and demonstrate a low cost micro-pump capable of significantly increasing pressure and flow rate to the thrusters, to define a roadmap for larger increases if warranted, and to plan Phase II activities in order to reach a TRL 7 by the end of that phase. The technology builds on Aerojet Rocketdyne's work for NASA's on-going Green Propellant Infusion Mission (GPIM) and use the non-toxic hydroxyl ammonium-nitrate (HAN) -based propellant AF-M315E which provides 50% greater density-ISP than hydrazine. The micropump leverages the Air Force Research Lab's (AFRL) investments in pump-fed technologies for small spacecraft propulsion applications, which have led to steady state and pulsed hot fire tests with hydrazine and demonstrations with other propellants.

Primary U.S. Work Locations and Key Partners





Highly Capable Micropump-fed Propulsion System for Proximity Operations, Landing and Ascent Project Image

Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

Highly Capable Micropump-Fed Propulsion System for Proximity Operations, Landing and Ascent, Phase I

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Organizations Performing Work	Role	Type	Location
Flight Works, Inc.	Lead Organization	Industry	Irvine, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

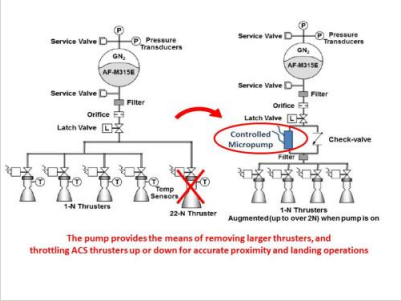
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137706)*

Images



Project Image
Highly Capable Micropump-fed Propulsion System for Proximity Operations, Landing and Ascent Project Image *(https://techport.nasa.gov/image/129511)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Flight Works, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

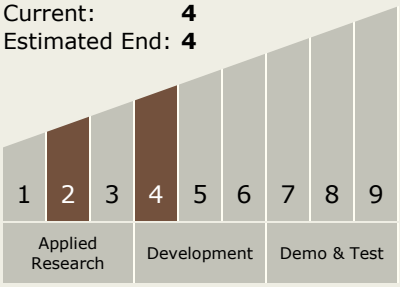
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Andrea C Besnard

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Completed Technology Project (2014 - 2014)

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.3 Landing
    - TX09.3.2 Propulsion Systems for Landing

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System